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(FILE 'HOME' ENTERED AT 17:12:53 ON 22 AUG 2003)

FILE 'CA' ENTERED AT 17:13:05 ON 22 AUG 2003

L1 16062 S (STABILIZ? OR STABILIS? OR THIOL? OR DITHIOL? OR ALKANETHIOL OR AMIN?)(5A)(PARTICLE OR COLLOID? OR NANOPART? OR CLUSTER OR NANOCRYST? OR NANOCCLUS?)

L2 9804 S L1 NOT PY>1997

L3 2060 S L2 AND(METAL OR GOLD OR AU OR SILVER OR AG OR COPPER OR CU)

L4 200 S L3 AND(NANO? OR SELF ASSEMB?)

L5 1860 S L3 NOT L4

L6 51 S L5 AND ELECTRODE

L7 251 S L4,L6

L8 219 S L7 NOT(ORGANOSOL OR CUBO? OR GELATIN OR ELECTROPHOR? OR CITRATE)

L9 32 S L7 NOT L8

L10 8 S L9 AND(AMINOSILANE OR REDOX OR HIGHLY ORDERED OR INTERDIG? OR FUNCTIONALIZED)

L11 165 S L8 NOT(PASSIVAT? OR RADIOLY? OR SURFACT? OR ROUGH? OR MILLING OR SOL-GEL)

L12 54 S L8 NOT L11

L13 14 S L12 AND(SUPERLAT? OR SERS OR THIOL OR ALKANETHIOL)

L14 121 S L11 NOT(CADMIUM OR STAIR? OR 100 OR LYSINE OR ZEROVAL? OR OSMIUM OR SILICA)

L15 44 S L11 NOT L14

L16 6 S L15 AND(CORE SHELL OR LIGAND STABIL? OR 1 10)

L17 82 S L14 NOT(CATALY? OR CERAMIC OR CHOLEST? OR FUEL OR ELECTROFORM?)

L18 39 S L14 NOT L17

L19 1 S L18 AND HETERO

L20 65 S L17 NOT(GRAIN OR ANNEAL? OR COAL? OR HYDROSOL OR FERRITE OR AGI OR TLC OR ALUMINA)

L21 17 S L17 NOT L20

L22 2 S L21 AND THIOL/TI

L23 37 S L3 AND SPRAY?

L24 96 S L10,L13,L16,L19-20,L22

=> d bib,ab 1-96 124

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**L24 ANSWER 14 OF 96** CA COPYRIGHT 2003 ACS on STN

AN 127:128632 CA

TI Light-directed assembly of **nanoparticles**

AU Vossmeier, Tobias; DeIunno, Erica; Heath, James R.

CS Mol. Design. Inst., Lawrence Berkeley Lab. Dep. Chem. Biochem., Univ. California, Los Angeles, CA, 90095-1569, USA

SO Angewandte Chemie, International Edition in English (1997), 36(10), 1080-1083

AB Cleaned glass or silicon slides were treated with 3-aminopropyltrimethylethoxysilane and the surface amino groups were reacted with nitroveratryloxycarbonylglycine (NVOC) to produce photosensitive surface. Imagewise irradiation with  $\lambda > 340$  nm through a microchip mask yielded a pattern of free- and protected amino groups. The patterned substrate was kept overnight in the soln. containing 12-aminododecane-capped **Au particles** to bind **Au nanocrystals** to the surface-bound amino-groups. To amplify particle binding the surface-bound **Au particles** were treated with 1,8-octanedithiol to yield free, surface-bound thiol groups on the areas where **Au particles** were attached to the surface. Following the dithiol treatment the slides were dipped again in the **gold soln.** to bind more **Au nanocrystals** on the previously bound particles. This dithiol amplification was repeated several times to enhance the micropattern contrast until it was readily visible with

the naked eye or via optical microscope.

L24 ANSWER 20 OF 96 CA COPYRIGHT 2003 ACS on STN

AN 127:26748 CA

TI Synthesis of **nanoscale** arrays of coupled **metal** dots

AU Osifchin, Richard G.; Andres, Ronald P.; Henderson, Jason I.; Kubiak, Clifford P.; Dominey, Raymond N.

CS School of Chemical Engineering, Purdue University, West Lafayette, IN, 47907, USA

SO Nanotechnology (1996), 7(4), 412-416

AB The authors report on a synthetic strategy for fabrication of close-packed planar arrays of **nanometer** diam. **metal** clusters. The clusters are single fcc. crystals of **Au**, each encapsulated by a monolayer of alkyl **thiol** mols. They are electronically coupled by aryl dithiol mols. This structure, which is of interest for developing **nanoscale** electronics, is created using mol. **self-assembly** methods. It should prove possible to tune the cond. of such arrays from the metallic limit to the insulating limit by controlling the size of the **Au** clusters and the strength of the electronic coupling between them.

L24 ANSWER 39 OF 96 CA COPYRIGHT 2003 ACS on STN

AN 125:291641 CA

TI **Self-assembly** of a two-dimensional superlattice of molecularly linked **metal** clusters

AU Andres, Ronald P.; Bielefeld, Jeffery D.; Henderson, Jason I.; Janes, David B.; Kolagunta, Venkat R.; Kubiak, Clifford P.; Mahoney, William J.; Osifchin, Richard G.

CS School Chemical Engineering, Purdue Univ., West Lafayette, IN, 47907, USA

SO Science (Washington, D. C.) (1996), 273(5282), 1690-1693

AB Close-packed planar arrays of **nanometer**-diam. **gold** clusters that are covalently linked to each other by rigid, double-ended org. mols. were **self-assembled**. **Au nanocrystals**, each encapsulated by a monolayer of alkyl **thiol** mols., were cast from a **colloidal** soln. onto a flat substrate to form a close-packed cluster monolayer. Org. interconnects (aryl dithiols or aryl diisonitriles) displaced the alkyl **thiol** mols. and covalently linked adjacent **clusters** in the monolayer to form a two-dimensional superlattice of **metal** quantum dots coupled by uniform tunnel junctions. Elec. conductance through such a superlattice of 3.7-nm-diam. **Au** clusters, deposited on a SiO<sub>2</sub> substrate in the gap between two **Au** contacts and linked by an aryl diisonitrile [1,4-di(4-isocyanophenylethynyl)-2-ethylbenene], exhibited nonlinear Coulomb charging behavior.

L24 ANSWER 47 OF 96 CA COPYRIGHT 2003 ACS on STN

AN 125:100580 CA

TI **Nanocrystal gold** molecules

AU Whetten, R. L.; Khoury, J. T.; Alvarez, M. M.; Murthy, S.; Vezmar, I.; Wang, Z. L.; Cleveland, C.; Luedtke, W. D.; Landman, Uzi

CS School Physics, Georgia Institute Technology, Atlanta, GA, 30332-0430, USA

SO NATO ASI Series, Series E: Applied Sciences (1996), 316(Chemical Physics of Fullerenes 10 (and 5) Years Later), 475-490

AB A discrete family of **Au nanocrystals** passivated by **self-assembled** monolayers was processed and isolated as distinct, highly purified mol. materials of high intrinsic stability. While each member of this family has a definite mass and structure, they share common features: fcc. **Au** lattices, morphologies of a dominant truncated-octahedral motif, and a strongly bound and compact protective layer conferring remarkable materials properties.

L24 ANSWER 56 OF 96 CA COPYRIGHT 2003 ACS on STN

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AN 124:271424 CA  
TI Two-Dimensional Arrays of Colloidal **Gold** Particles: A Flexible Approach to Macroscopic **Metal** Surfaces  
AU Grabar, Katherine C.; Allison, Keith J.; Baker, Bonnie E.; Bright, Robin M.; Brown, Kenneth R.; Freeman, R. Griffith; Fox, Audrey P.; Keating, Christine D.; Musick, Michael D.; Natan, Michael J.  
CS Department of Chemistry, Pennsylvania State University, University Park, PA, 16802-6300, USA  
SO Langmuir (1996), 12(10), 2353-61  
AB Covalent attachment of **nanometer**-scale colloidal **Au** particles to organosilane-coated substrates is a flexible and general approach to formation of macroscopic **Au** surfaces that have well-defined **nanoscale** structure. Variations in substrate (glass, **metal**, Al<sub>2</sub>O<sub>3</sub>), geometry (planar, cylindrical), functional group (-SH, -P(C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>, -NH<sub>2</sub>, -CN), and particle diam. (2.5-120 nm) demonstrate that each component of these assemblies can be changed without adverse consequences. Information about particle coverage and interparticle spacing was obtained by using AFM, field emission SEM, and quartz crystal gravimetry. Bulk surface properties were probed with UV-visible spectroscopy, cyclic voltammetry, and surface enhanced Raman scattering. Successful application of the latter 2 techniques that these substrates may have value for Raman and electrochem. measurements. This assembly method is compared with previous methods for controlling the **nanoscale** roughness of **metal** surfaces, and its potential applicability to the assembly of other colloidal materials is discussed.

L24 ANSWER 58 OF 96 CA COPYRIGHT 2003 ACS on STN

AN 124:186411 CA  
TI Structure and Chain Dynamics of **Alkanethiol**-Capped **Gold** Colloids  
AU Badia, A.; Gao, W.; Singh, S.; Demers, L.; Cuccia, L.; Reven, L.  
CS Department of Chemistry, McGill University, Montreal, QC, H3A 2K6, Can.  
SO Langmuir (1996), 12(5), 1262-9  
AB The structure and dynamical behavior of short and long chain alkanethiols, CH<sub>3</sub>(CH<sub>2</sub>)<sub>7</sub>SH and CH<sub>3</sub>(CH<sub>2</sub>)<sub>17</sub>SH, and of a hydroxyalkanethiol, HO(CH<sub>2</sub>)<sub>16</sub>SH, adsorbed onto **gold nanoparticles** were studied by variable temp. solid-state <sup>13</sup>C NMR spectroscopy. In both the soln. and solid state, the resonances of the first three carbons next to the sulfur headgroup disappear upon binding to the **gold**, indicating a strong interaction with the surface. A <sup>13</sup>C-enriched sample, CH<sub>3</sub>(CH<sub>2</sub>)<sub>12</sub>\*CH<sub>2</sub>SH/**gold**, displays a broad resonance centered at 42 ppm for the carbon next to the sulfur headgroup. Whereas the solid-state <sup>13</sup>C shifts of CH<sub>3</sub>(CH<sub>2</sub>)<sub>7</sub>SH/**gold** are essentially the same as in soln., the methylene carbons of CH<sub>3</sub>(CH<sub>2</sub>)<sub>17</sub>SH and HO(CH<sub>2</sub>)<sub>16</sub>SH/**gold** shift downfield by 4.5 ppm in the solid state, indicating that the chains crystallize into an extended all-trans conformation. The high conformational order, along with reduced methylene proton line widths in the CH<sub>3</sub>(CH<sub>2</sub>)<sub>17</sub>SH/**gold** sample, indicates that the chains are undergoing large-amplitude motions about their long axes. Mol. mobility increases toward the unbound ends which have a higher population of gauche conformers. Relaxation measurements show the coexistence of motionally restricted all-trans chains and a smaller population of liq.-like conformationally disordered chains in CH<sub>3</sub>(CH<sub>2</sub>)<sub>17</sub>SH/**gold** at room temp. The two types of chains are proposed to arise from close packing of the **gold** colloidal spheres, resulting in interstitial spaces and regions where chains of neighboring colloids can interdigitate to produce ordered domains. Phase transitions of the **thiol**-capped **gold nanocrystals**, which are detected by differential scanning calorimetry, are shown to involve a reversible disordering of the alkyl chains.

L24 ANSWER 59 OF 96 CA COPYRIGHT 2003 ACS on STN

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AN 124:161319 CA  
TI Single electron tunneling in molecular **nanosttructures** of single-crystal **gold clusters** attached by **dithiols** to Au(111): Direct I(V) measurements of individual surface attached **gold clusters** by STM  
AU Osifchin, R. G.; Mahoney, W.; Andres, R. P.; Dorogi, M.; Reifenberger, R. G.; Feng, S.; Henderson, J. I.; Bein, T.; Kubiak, Clifford P.  
CS Department Chemistry, Purdue University, West Lafayette, IN, 47907-1393, USA  
SO Polymeric Materials Science and Engineering (1995), 73, 208-9  
AB The authors report the chem. attachment of large (> 200 atom) **gold clusters** by **dithiols** to **gold** surfaces, and the use of this mol. **nanosttructure** to directly measure current-voltage responses by STM of individual **gold clusters** linked by mols. to surfaces. Dense, highly oriented monolayers of alk. thiols such as 1-octadecanethiol are formed on **gold** by spontaneous adsorption from ethanol solns. The authors show that a SAM (**self-assembled monolayer**) of a particular thiol can be completely displaced by exposure to a soln. contg. a different thiol. Results of reflection absorption IR spectroscopy, surface-enhanced Raman spectroscopy, ellipsometry, and measurement of advancing contact angle demonstrate that, in the case of a double-ended thiols, SAMs can be formed in which only one end of the dithiol attaches to the **gold** surface. Finally, the authors show that SAMs of dithiols can be used as chem. "sticky" surfaces for subsequent attachment of cryst. **nanometer-scale gold clusters**.

L24 ANSWER 71 OF 96 CA COPYRIGHT 2003 ACS on STN

AN 123:128557 CA  
TI A fascinating new field in **colloid science**: small **ligand-stabilized metal clusters** and their possible application in microelectronics. Part II. Future directions  
AU Schoen, G.; Simon, U.  
CS Institut Anorganische Chemie, Universitaet Essen, Essen, 45127, Germany  
SO Colloid and Polymer Science (1995), 273(3), 202-18  
AB A review with 55 refs. Small **metal clusters**, like Au<sub>55</sub>(PPh<sub>3</sub>)<sub>12</sub>Cl<sub>6</sub>, which fall in the size regime of 1-2 nm are colloidal **nanoparticles** with quantum properties in the transitional range between **metals** and semiconductors. These chem. tailored quantum dots show by the Quantum Size Effect (QSE) a level splitting between 20 and 100 meV, increasing from small particle sizes to the mol. state. The org. ligand shell surrounding the cluster acts like a dielec. "spacer" generating capacitances between neighboring clusters down to 10-18 F. Therefore, charging effects superposed by level spacing effects can be obsd. The **ligand-stabilized colloidal** quantum dots in condensed state can be described as a novel kind of artificial solid with extremely narrow mini or hopping bands depending on the chem. adjustable thickness of the ligand shell and its properties. Since its discovery, the Single Electron Tunneling (SET) effect has been recognized to be the fundamental concept for ultimate miniaturization in microelectronics. The controlled transport of charge carriers in arrangements of **ligand-stabilized clusters** has been obsd. already at room temp. through Impedance Spectroscopy (IS) and Scanning Tunneling Spectroscopy (STS). This reveals future directions with new concepts for the realization of simple devices for Single Electron Logic (SEL). Part II presents models and connections between microscopic and macroscopic level, regardless of whether there already exist suitable **nanoscale metal cluster compds.**, and is aimed at the ultimate properties for a possible application in microelectronics.

L24 ANSWER 74 OF 96 CA COPYRIGHT 2003 ACS on STN

AN 123:73202 CA  
TI Chemical synthesis of large **metal clusters** and their properties  
AU Schmid, G.

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CS Inst. Inorg. Chem., Univ. Essen, Essen, 45117, Germany  
SO Nanostructured Materials (1995), 6(1-4), 15-24  
AB A review, with 16 refs. The synthesis of ligand-stabilized metal colloids and clusters in the size range of 1-30 nm succeeds by redn. of corresponding metal salts in the presence of appropriate ligand mols. Due to the protection of the surface atoms by the chem. bonded ligands these materials can be isolated and handled as a solid materials. The main interest in these materials involves the boundary of the metallic state. Susceptibility measurements indicate that 15-nm Pd colloids already show significant deviations from the bulk behavior. However, Moessbauer and NMR spectroscopic studies as well as cond. measurements prove that even 1-3-nm clusters still possess freely mobile electrons. Impedance and scanning tunneling spectroscopy identify 1.4-nm two-shell clusters as species with beginning semiconducting properties. Consequently, such clusters can act as individually working quantum dots and so may play a decisive role in the future of nanoelectronics.

L24 ANSWER 75 OF 96 CA COPYRIGHT 2003 ACS on STN

AN 123:41388 CA

TI A fascinating new field in colloid science: small ligand-stabilized metal clusters and possible application in microelectronics. Part I. State of the art

AU Schoen, G.; Simon, U.

CS Institut Anorganische Chemie, Universitaet Essen, Essen, 45127, Germany

SO Colloid and Polymer Science (1995), 273(2), 101-17

AB A review with 84 refs. Small metal clusters, like Au<sub>55</sub> (PPh<sub>3</sub>)<sub>12</sub>Cl<sub>6</sub>, which fall in the size regime of 1-2 nm are colloidal nanoparticles with quantum properties in the transitional range between metals and semiconductors. These chem. tailored quantum dots show regarding the Quantum Size Effect (QSE) a level splitting between 20 and 100 meV, increasing from small particle sizes to the mol. state. The org. ligand shell surrounding the cluster acts like a dielec. "spacer" generating capacitances between neighboring clusters down to 10-18 F. Therefore, charging effects superposed by level spacing effects can be obsd. The ligand-stabilized colloidal quantum dots in condensed state can be described as a novel kind of artificial solid with extremely narrow mini or hopping bands depending on the chem. adjustable thickness of the ligand shell and its properties. Since its discovery, the Single Electron Tunneling (SET) effect has been recognized to be the fundamental concept for ultimate miniaturization in microelectronics. The controlled transport of charge carriers in arrangements of ligand-stabilized clusters has been obsd. already at room temp. through Impedance Spectroscopy (IS) and Scanning Tunneling Spectroscopy (STS). This reveals future directions with new concepts for the realization of simple devices for Single Electron Logic (SEL). Part I presents the fundamental aspects of small ligand-stabilized metal clusters as well as their phys. properties, emphasizing their electronic and optical properties with respect to dielec. response at ambient temps.

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